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EXAMINER	
BERRY, RENEE R	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/685,785	**Applicant(s)** THOMPSON ET AL.	
	Examiner Renee R. Berry	**Art Unit** 1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 December 2006*.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.
4a) Of the above claim(s) *23* is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1-22 and 24-38* is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date *1/18/05*.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of Group I in the reply filed on December 11, 2006 is acknowledged. The traversal is on the ground(s) that there is a relationship between Group I-the claimed process and Group II-the compound. This is not found persuasive because the inventions are distinct and have different classifications and therefore it would be an additional burden on the Examiner to consider the two different inventions under two different standards.

The requirement is still deemed proper and is therefore made FINAL.

Claim 23 is withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on December 11, 2006.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The term “cyclopentadienyl-like” is indefinite.

Claim Rejections - 35 USC § 103

Claims 1, 37 and 38 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over US Patent No. 6,605,735 to Kawano et al.

In regard to claim 1, Kawano teaches a process for producing at least one member of the group consisting of a film, a coating and a powder, comprising the step of decomposing at least one asymmetric metallocene precursor having a general formula CpMCp', where M is a metal selected from the group consisting of Ru, Os and Fe; Cp is a first substituted cyclopentadienyl or a cyclopentadienyl-like moiety that includes at least one substituent group D.sub.1; Cp' is a second substituted a cyclopentadienyl-like (pentadienyl can be considered "cyclopentadienyl-like) moiety that includes at least one substituent group D.sub.1'; wherein D.sub.1 is different from D.sub.1'; D.sub.1 is selected from the group consisting of: X; C.sub.a1H.sub.b1X.sub.c1; C.sub.a2H.sub.b2X.sub.c2(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1; C.sub.a2H.sub.b2X.sub.c2OC.sub.a1H.sub.b1X.sub.c1; C.sub.a2H.sub.b2X.sub.c2(C.dbd.O)OC.sub.a1H.sub.b1X.sub.c1; and C.sub.a2H.sub.b2X.sub.c2O(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1; where X is a halogen atom; a1 is an integer from 2 to 8; b1 is an integer from 0 to 2(a1)+1-c1; c1 is an integer from 0 to 2(a1)+1-b1; b1+c1 is at least 1; a2 is an integer from 0 to 8; b2 is an integer from 0 to 2(a2)+1-c2; c2 is an integer from 0 to 2(a2)+1-b2; and D.sub.1' is selected from the group consisting of: X C.sub.a1H.sub.b1X.sub.c1, C.sub.a2H.sub.b2X.sub.c2-

(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1, C.sub.a2H.sub.b2X.sub.c2OC.sub.a1H.sub.-b1X.sub.c1, C.sub.a2H.sub.b2X.sub.c2(C.dbd.O)OC.sub.a1H.sub.b1X.sub.c1, and C.sub.a2H.sub.b2X.sub.c2O(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1 where, X is Fl, Cl, Br or I; a1 is an integer from 1to 8; b1 is an integer from 0 to 2(a1)+1-c1; c1 is an integer from 0 to 2(a1)+1-b1; b1+c1 is equal to or greater than 1; a2 is an integer from 0 to 8; b2 is an integer from 0 to 2(a2)+1-c2; c2 is an integer from 0 to 2(a2)+1-b2; and b2+c2 is equal to or greater than 1, thereby producing the film, coating or powder at column 3, general formula (1) for D and D', column 9, lines 29-67 to column 10, lines 1-3 and column 21, claims 12 and 16.

In regard to claim 37, Kawano teaches the process of claim 1, wherein the film, coating or powder is produced by a gas phase deposition at column 12, lines 1-30.

In regard to claim 38, Kawano teaches the process of claim 1, wherein the film, coating or powder is produced in-situ at column12, lines 1-30.

Alternatively, Kawano discloses that R_1 –R_4 of the general formula can be the same or different and can include alkyl among other groups including species within the claimed formula and those not falling therein (column 3, lines 50-60). It would have been obvious to use compounds wherein R_1 is different from R_2 –R_4 and each are alkyl as the compounds are taught by Kawano as operable. One would have been motivated to do so with a reasonable expectation of successfully depositing Ru-containing films.

Claims 1-13, 16-32, 37 and 38 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over US Patent No. 6,465,669 to Okamoto.

In regard to claim 1, Okamoto teaches a process for producing at least one member of the group consisting of a film, a coating and a powder, comprising the step of decomposing at least one asymmetric metallocene precursor having a general formula CpMCp', where M is a metal selected from the group consisting of Ru, Os and Fe; Cp is a first substituted cyclopentadienyl or a cyclopentadienyl-like moiety that includes at least one substituent group D.sub.1; Cp' is a second substituted cyclopentadienyl or a cyclopentadienyl-like moiety that includes at least one substituent group D.sub.1'; wherein D.sub.1 is different from D.sub.1'; D.sub.1 is selected from the group consisting of: X; C.sub.a1H.sub.b1X.sub.c1; C.sub.a2H.sub.b2X.sub.c2(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1; C.sub.a2H.sub.b2X.sub.c2OC.sub.a1H.sub.b1X.sub.c1; C.sub.a2H.sub.b2X.sub.c2(C.dbd.O)OC.sub.a1H.sub.b1X.sub.c1; and C.sub.a2H.sub.b2X.sub.c2O(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1; where X is a halogen atom; a1 is an integer from 2 to 8; b1 is an integer from 0 to 2(a1)+1-c1; c1 is an integer from 0 to 2(a1)+1-b1; b1+c1 is at least 1; a2 is an integer from 0 to 8; b2 is an integer from 0 to 2(a2)+1-c2; c2 is an integer from 0 to 2(a2)+1-b2; and D.sub.1' is selected from the group consisting of: X C.sub.a1H.sub.b1X.sub.c1, C.sub.a2H.sub.b2X.sub.c2-(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1, C.sub.a2H.sub.b2X.sub.c2OC.sub.a1H.sub.-

b1X.sub.c1, C.sub.a2H.sub.b2X.sub.c2(C.dbd.O)OC.sub.a1H.sub.b1X.sub.c1, and C.sub.a2H.sub.b2X.sub.c2O(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1 where, X is Fl, Cl, Br or I; a1 is an integer from 1to 8; b1 is an integer from 0 to 2(a1)+1-c1; c1 is an integer from 0 to 2(a1)+1-b1; b1+c1 is equal to or greater than 1; a2 is an integer from 0 to 8; b2 is an integer from 0 to 2(a2)+1-c2; c2 is an integer from 0 to 2(a2)+1-b2; and b2+c2 is equal to or greater than 1, thereby producing the film, coating or powder at column 3, lines 1-20 and column 5. Given the general formula and description of the substituents R_1 –R_5 and R_1' –R_5' at column 3, lines 1-31, one could readily envisage compounds falling within the claimed general formula CpRuCp' wherein Cp has a substituent D_1 and Cp' has a substituent D'1 and both are described by $C_{a1}H_{b1}X_{c1}$ and are different. Alternatively, such compounds are clearly encompassed by the formula of Okamoto and would be expected to have the increased thermal stability taught as described at column 3, lines 29-31 through the use of bulky substituents, as such it would have been obvious to select these species with a reasonable expectation of there being operable for depositing Ru-containing films and providing increased thermal stability of the precursor.

In regard to claim 2, Okamoto teaches a process for producing a film, comprising the step of decomposing at least one precursor in the presence of a substrate, wherein the decomposition is thermal, chemical, photochemical or plasma-activated, and said precursor has a general formula CpMCp', where M is a metal selected from the group consisting of Ru, Os and Fe; Cp is a first substituted cyclopentadienyl or indenyl moiety that includes at least one substituent group D.sub.1; Cp' is a second substituted cyclopentadienyl or indenyl moiety that includes at least one substituent group D.sub.1'; wherein D.sub.1 is different from D.sub.1'; D.sub.1 is selected from the group consisting of: X; C.sub.a1H.sub.b1X.sub.c1; C.sub.a2H.sub.b2X.sub.c-2(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1; C.sub.a2H.sub.b2X.sub.c2OC.sub.a1H.sub-.b1X.sub.c1; C.sub.a2H.sub.b2X.sub.c2(C.dbd.O)OC.sub.a1H.sub.b1X.sub.c1; and C.sub.a2H.sub.b2X.sub.c2O(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1; where X is a halogen atom; a1 is an integer from 2 to 8; b1 is an integer from 0 to 2(a1)+1-c1; c1 is an integer from 0 to2(a1)+1-b1; b1+c1 is at least 1; a2 is an integer from 0 to 8; b2 is an integer from 0 to 2(a2)+1-c2; c2 is an integer from 0 to 2(a2)+1-b2; and D1' is selected from the group consisting of: X C.sub.a1H.sub.b1X.sub.c1, C.sub.a2H.sub.b2X.sub.c2(C.dbd-.O)C.sub.a1H.sub.b1X.sub.c1, C.sub.a2H.sub.b2X.sub.c2OC.sub.a1H.sub.b1X.sub.c1, C.sub.a2H.sub.b2X.sub.c2(C.dbd.O)OC.sub.a1H.sub.b1X.sub.c1, and C.sub.a2H.sub.b2X.sub.c2O(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1 where, X is Fl, Cl, Br or I; a1 is an integer from 1to 8; b1 is an integer from 0 to 2(a1)+1-c1; c1 is an integer from 0 to 2(a1)+1-b1; b1+c1 is equal to or greater than 1; a2 is an integer from 0 to 8; b2 is an integer from 0 to 2(a2)+1-c2; c2 is an integer from 0 to 2(a2)+1-b2; and b2+c2 is equal to or greater than 1, thereby forming a film on the substrate powder at column 3, lines 1-20, Cp and Cp' are the substituents of the cyclopentadiene ring column 3, lines 1-20. Given the general formula and description of the substituents R_1 –R_5 and R_1' –R_5' at column 3, lines 1-31, one could readily envisage compounds falling within the claimed general formula CpRuCp' wherein Cp has a substituent D_1 and Cp' has a substituent D'1 and both are described by $C_{a1}H_{b1}X_{c1}$ and are different. Alternatively, such compounds are clearly encompassed by the formula of Okamoto and would be expected to have the increased thermal stability taught as described at column 3, lines 29-31 through the use of bulky substituents, as such it would have been obvious to select these species with a reasonable expectation of there being operable for depositing Ru-containing films and providing increased thermal stability of the precursor.

In regard to claim 3, Okamoto teaches the process of claim 2, wherein either or both of Cp and Cp' moiety includes at least one additional substituent, D.sub.x, selected from the group consisting of: X C.sub.a1H.sub.b1X.sub.c1, C.sub.a2H.sub.b2X.sub.c2-(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1, C.sub.a2H.sub.b2X.sub.c2OC.sub.a1H.sub.-b1X.sub.c1, C.sub.a2H.sub.b2X.sub.c2(C.dbd.O)OC.sub.a1H.sub.b1X.sub.c1, and C.sub.a2H.sub.b2X.sub.c2O(C.dbd.O)C.sub.a1H.sub.b1X.sub.c1, where, X is Fl, Cl, Br or I; a1 is an integer from 0 to 8; b1 is an integer from 0 to 2(a1)+1-c1; c1 is an integer from 0 to 2(a1)+1-b1; b1+c1 is equal to or greater than 1; a2 is an integer from 0 to 8; b2 is an integer from 0 to 2(a2)+1-c2; c2 is an integer from 0 to 2(a2)+1-b2; and b2+c2 is equal to or greater than 1 at column 3, lines 1-20.

In regard to claim 4, Okamoto teaches the process of claim 2, wherein said precursor is vaporized and the vapor is directed into a deposition reactor housing the substrate at column 5, lines 6-10.

In regard to claim 5, Okamoto teaches the process of claim 4, wherein the deposition reactor is at a pressure in the range of from about 0.01 Torr and about 760 Torr at column 5, lines 13-18 (0.5 Torr).

In regard to claim 6, Okamoto teaches the process of claim 5, wherein the deposition reactor is at a pressure in the range of from about 0.1 Torr and about 760 Torr at column 5, lines 13-18 (0.5 Torr).

In regard to claim 7, Okamoto teaches the process of claim 6, wherein the deposition reactor is at a pressure in the range of from about 1 Torr and about 50 Torr at column 8, line 10.

In regard to claim 8, Okamoto teaches the process of claim 2, wherein the substrate is at a temperature in the range of from about 75.degree. C. to about 700.degree. C at column 5, lines 1-18.

In regard to claim 9, Okamoto teaches the process of claim 8, wherein the substrate is at a temperature in the range of from about 250.degree. C. to about 450.degree. C at column 5, lines 13-18. (200 ^{0}C is deemed to be encompassed by about 250 ^{0}C)

In regard to claim 10, Okamoto teaches the process of claim 2, wherein the substrate is comprised of a material selected from the group consisting of a metal; a metal silicide; a semiconductor; an insulator and a barrier material at column 8, lines 1-5 (silicon dioxide).

In regard to claim 11, Okamoto teaches the process of claim 2, wherein the substrate is a wafer at column 8, lines 66-67 to column 9, lines 1-2.

In regard to claim 12, Okamoto teaches the process of claim 2, wherein the process includes decomposing an organometallic precursor at column 4, lines 24-34.

In regard to claim 13, Okamoto teaches the process of claim 2, wherein vapor of said precursor is combined with a carrier gas at column 5, lines 13-18.

As to claim 16, Okamoto teaches combination of the Ru precursor with hydrogen reactant gas to form a process gas at column 5, lines 5-20.

As to claim 17, this gas is supplied to a MOCVD reactor (Figure #1).

As to claim 18, Okamoto depicts exhaust of gas in Figure # 1 to maintain a pressure of 0.5 Torr as disclosed at column 5, lines 5-20.

In regard to claim 19, Okamoto teaches the process of claim 2, wherein said precursor is 1-methyl,1'-ethyl ruthenocene at column 3, general formula (1) for D and D' and at column 6, lines 8-11.

In regard to claim 20, Okamoto teaches the process of claim 2 wherein D.sub.1 is methyl and D.sub.1' is selected from the group consisting of ethyl, propyl, isopropyl, n-butyl, sec-butyl and tert-butyl at column 3, general formula (1) for D and D' and at column 3, lines 32-37.

In regard to claim 21, Okamoto teaches the process of claim 2, wherein D.sub.1 is ethyl and D.sub.1' is selected from the group consisting of propyl, isopropyl, n-butyl, sec-butyl and tert-butyl at column 3, general formula (1) for D and D' and at column 3, lines 32-37.

In regard to claim 22, Okamoto teaches the process of claim 2, wherein D.sub.1 is propyl and D.sub.1' is selected from the group consisting of isopropyl, n-butyl, sec-butyl and tert-butyl at column 3, general formula (1) for D and D' and at column 3, lines 32-37.

In regard to claim 24, Okamoto teaches the process of claim 2, wherein D.sub.1 is n-butyl and D.sub.1' is selected from the group consisting of sec-butyl and tert-butyl at column 3, general formula (1) for D and D' and at column 3, lines 32-37.

In regard to claim 25, Okamoto teaches the process of claim 2, wherein D.sub.1 is sec-butyl and D.sub.1' is tert-butyl at column 3, general formula (1) for D and D' and at column 3, lines 32-37.

In regard to claim 26, Okamoto teaches the process of claim 2, wherein the film includes ruthenium at column 4, lines 55-67.

In regard to claim 27, Okamoto teaches the process of claim 2, wherein the film includes ruthenium oxide at column 1, lines 8.

In regard to claim 28, Okamoto teaches the process of claim 2, wherein the film has a thickness that is less than about 500 nanometer at column 1, line 8.

In regard to claim 29, Okamoto teaches the process of claim 2, wherein the film has a thickness that is less than about 200 nanometer at column 7, Tables 1 & 2.

In regard to claim 30, Okamoto teaches the process of claim 2, wherein the film has a thickness that is less than 50 nanometer at column 7, Tables 1 & 2.

In regard to claim 31, Okamoto teaches the process of claim 2, wherein the film has a thickness that is less than about 30 nanometer at column 7, Tables 1 & 2.

In regard to claim 32, Okamoto teaches the process of claim 2, wherein said precursor is represented by the following molecular formula at column 3, general formula (1) for D and D' and at column 3, lines 1-20.

In regard to claim 37, Okamoto teaches the process of claim 1, wherein the film, coating or powder is produced by a gas phase deposition at column 5, lines 5-20.

In regard to claim 38, Okamoto teaches the process of claim 1, wherein the film, coating or powder is produced in-situ at column 5, lines 5-20.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 14, 15, 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,465,669 to Okamoto in view of US Patent No 6,482,740 to Soininen et al.

As to claims 14 and 15, Okamoto discloses deposition of RuO but does not explicitly disclose combining the precursor with an oxidizing component such as oxygen or ozone.

As to claims 35 and 36, Okamoto does not disclose deposition of the Ru-containing films in layers or by ALD.

Soininen discloses deposition of RuO films by ALD by combining pulses of a Ru precursor having sufficient volatility and high thermal stability with pulses of oxidizing gases such as ozone or oxygen at column 6, lines 43 to column 7, lines 5; column 9, lines 40-50; and column 11, lines 25-30.

Soininen further teaches that use of ALD to deposit these films provides excellent step coverage along with dense and pinhole free structures. It would have been obvious to provide RuO layers by combining the precursors of Okamoto with oxidizing gases such as oxygen or ozone and deposit the layers using ALD. One would have been motivated to do so given the expectation of such method being operable for forming the RuO films and with a reasonable expectation of achieving films with excellent step coverage that are dense and pinhole free.

Claims 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,465,669 to Okamoto in view of US Patent No. 4,970,093 to Sievers et al.

Okamoto does not explicitly disclose providing the precursor with a solvent such as supercritical solvent during decomposition.

However, because Siever discloses that providing CVD precursors to a CVD reactor by dissolving them in supercritical solvents allows precise control of stoichiometry and high deposition rates (Abstract; column 2, lines 50-60).

It would have been obvious to deliver the precursors of Okamoto to the CVD chamber using supercritical solvents. One would have been motivated to do so to achieve precise control over stoichiometry and improved deposition rates.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Renee R. Berry whose telephone number is (571) 272-1459. The examiner can normally be reached on 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tim Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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July 9, 2007

TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER